Non-Electric Detonator Examinations

1 Scope

These procedures describe the process for non-electric detonator examinations and apply to explosives and hazardous devices caseworking personnel who examine non-electric detonators and their post-blast remains to determine identifying and functionality information.

2 Introduction

A non-electric detonator, also referred to as a blasting cap or fuse cap, is a small explosive component whose general purpose is to initiate a detonator-sensitive explosive into which it is inserted. Non-electric detonators generally consist of a metal shell loaded with sensitive explosives pressed into the bottom of the shell. One end of the shell is open for the introduction of safety fuse or detonating cord. Proper initiation of the safety fuse causes a spit of flame from the end of the fuse to initiate the explosives within the detonator. Proper initiation of the detonating cord causes the shock wave from the cord to initiate the explosives within the detonator.

Non-electric detonators are generally utilized in commercial blasting operations to initiate larger quantities of detonator-sensitive explosives. Non-electric detonators can also be used in the fabrication of improvised explosive devices (IEDs) to initiate other explosives or as the main explosive component within the device. Depending on the amount of explosive into which the detonator is inserted and its exact use within the IED, it may be possible to recover detonator fragments in a post-blast environment. Through an examination of a non-electric detonator, or its fragmented remains, its functionality within the IED and manufacturing information can sometimes be determined. This data can provide the investigator lead information which can facilitate the identification of the subject(s) and/or group responsible for constructing the device.

3 Equipment/Material/Reagents

Below is a list of items that can be used to examine non-electric detonators and their post-blast remains. Explosives and hazardous devices personnel should choose the most appropriate items based on the nature of the evidence.

- Personal Protective Equipment (e.g., lab coat, eye protection, full face shield, gloves)
- Hand tools (e.g., tweezers, pliers, cutters, utility knife)
- Cleaning materials and disinfectants (e.g., cloths, bleach, rubbing alcohol)
- Stereomicroscope (various magnifications)
- Ruler (e.g., standard 12 inch length)
- Micrometer
- Caliper

- X-ray machine
- Detonator inerting machine
- Pillboxes, glass containers, and static-proof plastic bags
- FBI Laboratory Explosives Reference Tool (EXPeRT) Database
- Reference texts, manuals, manufacturers' literature, and known materials are maintained in the Explosives library. Additional reference information can be obtained from direct contact with manufacturers and distributors.

4 Standards and Controls

Not applicable.

5 Sampling or Sample Selection

Not applicable.

6 Procedures

These procedures are implemented as part of the overall examination process outlined in the Device Examinations Standard Operating Procedure (SOP). Refer to the Safety section of this SOP before starting any examinations.

Explosives and hazardous devices personnel will:

6.1 Before any examination is conducted, ensure that the item(s), as well as its containers and packaging, have been appropriately marked in accordance with the FBI *Laboratory Operations Manual (LOM)* (i.e., item number, initials, and full Laboratory number, when practicable).

6.2 Ensure care is taken not to obliterate any identifying marks which have been previously placed on the item, or obliterate any microscopic marks of value.

6.3 Visually examine the item(s) for any trace evidence that could be of value. This evidence could include, but not limited to the following: hairs, fibers, blood, paint, or other particles.

6.3.1 If trace evidence is to be examined or preserved, contact the appropriate unit and determine if the material should be removed. Record the presence of the material by means of notes, sketches, or photographs before it is removed.

6.4 Note the physical characteristics of the detonator through visual/microscopic examination. Physical measurements should be taken as well to aid in determining as many of the following attributes as possible:

- Construction characteristics
- Manufacturer
- Brand
- Type
- Explosives present
- Special properties (e.g., physical condition, functionality, modifications made for use in IED)

6.5 If possible, determine the manufacturer, brand, and type by searching the EXPeRT database, Explosive reference files, manufacturers' literature, and/or reference or known materials collection. Identifications or associations are made by comparison of observable/measurable physical characteristics with those provided in the above reference/literature materials.

7 Calculations

Not applicable.

8 Measurement Uncertainty

Not applicable.

9 Limitations

Refer to the Limitations section in the Device Examinations SOP and Appendix B of the Explosives and Hazardous Devices Report Writing Guidelines SOP.

10 Safety

Safety protocols, contained within the FBI Laboratory Safety Manual, will be observed at all times.

10.1 Non-electric detonators should be protected from sources of heat, shock, and friction. Should a detonator be accidentally initiated it has the capability of inflicting personal injury or death; therefore, it should be handled with care. Analysts should follow the below guidance regarding the handling of non-electric detonators:

10.1.1 When not under examination detonators will be stored in approved, explosion-proof containers (e.g., MK663 containers, explosive magazine).

10.1.2 Detonators will be shipped in Department of Transportation (DOT) approved containers (e.g., MK663 containers).

10.1.3 Detonators will be rendered safe, or inert, by using available, specialized equipment

(e.g., detonator inerting machine).

10.1.4 Appropriate facial protection (e.g., eye protection, full face shield) will be worn when handling live detonators.

10.1.5 Detonators and other types of explosive materials and components will not be examined at the same time or placed in close proximity to each other.

10.2 Protective gloves (e.g., latex, nitrile) must be worn when handling detonators that have been possibly exposed to blood, tissue, or other bodily fluids. Gloves will prevent exposure to possible hazardous material on the items and DNA transfer to the items.

10.3 Detonators potentially bearing blood or other bodily fluids will be cleaned in a 2.5% bleach solution or other suitable disinfectant following discussions with the personnel that may conduct other examinations of the detonators.

11 References

FBI Laboratory Division

FBI Laboratory Quality Assurance Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

FBI Laboratory Operations Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

FBI Laboratory Safety Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

Explosive Devices SOPs, Federal Bureau of Investigation, Laboratory Division, latest revisions.

Other

Atlas Powder Company, Explosives and Rock Blasting, Atlas Powder Company, 1987

Gregory, C.E., Explosives for North American Engineers, 3rd Edition, Trans Tech Publications, 1984

International Society of Explosives Engineers, Blasters' Handbook, 18th Edition, 2011

Persson, P.A., Rock Blasting and Explosives Engineering, CRC Press, 1994

Thurman, J.T., Practical Bomb Scene Investigation, 2nd Edition, CRC Press, 2011

Rev. #	Issue Date	History
0	07/07/2006	Original Issue to follow QATU formatting and ASCLD/LAB-International requirements
1	10/02/2017	Administrative changes for grammar, clarity, and conformance to revised QAM and LOM. Removed references to the Explosives Unit to applicability to those conducting explosives and hazardous devices related examinations. Deleted Calibration section since it is no longer required. Updated Limitations section to refer the reader to the Device Examination SOP and Appendix B of the Explosives and Hazardous Devices Report Writing Guidelines SOP. Updated references.

Approval

Redacted - Signatures on File

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